



PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

04 OCT 2005

Applicant's or agent's file reference P014693WO		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA416)	
International application No. PCT/GB 03/04199	International filing date (day/month/year) 30.09.2003	Priority date (day/month/year) 13.11.2002	
International Patent Classification (IPC) or both national classification and IPC H02H7/085			
Applicant FRDX LIMITED et al.			
<p>1. This International preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p><input type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the opinion</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p>			
Date of submission of the demand 21.05.2004		Date of completion of this report 12.10.2004	
Name and mailing address of the International preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized Officer Wilhelm, G Telephone No. +49 89 2399-2749 	

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB 03/04199

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-11 as originally filed

Claims, Numbers

1-12 as originally filed

Drawings, Sheets

1/5-5/5 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-12
	No: Claims	
Inventive step (IS)	Yes: Claims	1-12
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-12
	No: Claims	

2. Citations and explanations

see separate sheet

**INTERNATIONAL PRELIMINARY
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1. Reference is made to the following documents of the search report:
D1: GB-A-2 065 394 (NAT RES DEVICE) 24 June 1981 (1981-06-24)
D2: US-A-4 187 523 (GRAY GEORGE W) 5 February 1980 (1980-02-05)
2. Document **D1** discloses an apparatus for sensing short circuit faults.
 - 2.1 It is stated in D1 that it is difficult to provide adequate protection of a three phase supply against short circuits between the phase lines or to a neutral point while permitting direct-on-line starting of three phase squirrel cage induction motors connected to the three phase supply.
This problem is due to the fact that the value of the starting current drawn in each line by such a motor during direct-on-line starting has several times the amplitude of the current drawn when the motor is running under full load conditions and consequently no protection based merely upon sensing of the amplitude of the currents drawn is practicable for short circuit faults which are drawing currents which are of less amplitude than that of the motor starting current (col.1, ls.12-39).

The same problem can be derived from the application (cf. page 1).
 - 2.2 Fig. 2 of **D1** shows a graph of the amplitude i_R of the red line current against phase difference between the red line current and the red to yellow line voltage V_{R-Y} . As stated in more detail on page 1, lines 53-90, the apparatus for sensing short circuit faults in alternating current supply lines includes
 - means for sensing line current in a supply line and producing signals representative of the sensed amplitude and the phase of the sensed line current,
 - means for sensing the line to line or line to neutral voltage of the supply line and producing a signal representative of a phase of the line to line or line to neutral voltage,
 - difference means coupled to receive the signals which are representative of the phases of said current and voltage to produce a measure which varies directly with difference between the said phases, and
 - means for
 - comparing a relationship of the signal representative of **sensed** current amplitude and the said signal produced by the difference means **with a predetermined** relationship of amplitude and phase difference (straight line between points S and F in Fig. 2) and
 - producing in response thereto an output signal representative of whether or

not the sensed current amplitude is larger than the corresponding amplitude as determined by the said predetermined relationship for the said difference between the said phases
for opening (by means for interrupting), when a fault condition is detected, a circuit breaker having contacts in the supply lines to the motor. (cf. p.4, lines 116-118).

Any condition which results in the phase current amplitude and the phase difference defining a point **between the amplitude axis (ordinate) and the linear portion of Fig. 2** is a fault condition and can be detected by comparing the line current amplitude and phase difference values at the point in question with those defined by a predetermined relationship (cf. page 4, lines 35-46).

The point S corresponds to the conditions of red line current amplitude and red phase difference at stall or starting of the motor. As the rotor of the motor accelerates, the operating conditions move down the curve 12 from the point S to point F corresponding to operation under full mechanical loading, the motor then working at maximum efficiency. Regarding the problem stated above, the remainder of the curve between point F to N is of no relevance, it concerns the area of "normal operation" of the motor; in Fig. 5 this portion has been omitted.

2.3 Fig. 2 and page 5, lines 8-26, of the **application** only refer to the linear portion of the prior art graph of current versus the phase lag between the current and voltage measured under non-fault conditions. For each value of current amplitude in a line there is a unique value of phase lag. If a fault occurs the current amplitude increases and the phase lag reduces (an almost identical explanation is comprised in D2, page 3, lines 66-77).

Thus, a coordinate defined by a measured value of phase lag (abscissa value) and a measured value of current amplitude (ordinate value) that lies to the **left of the selected curve** indicates a fault condition.

2.4 **D1** is thus regarded as being the closest prior art to the subject-matter of **independent claim 1**, and discloses (the references in parentheses applying to this document):

An apparatus for producing a trip signal to activate a circuit breaker in an alternating current power line, said apparatus comprising:

a **sensing circuit** (phase discriminator 14) operable to sense values (V , I , Φ_V) representing:

a phase difference (Φ_V) between current and voltage in said power line; and
a current amplitude (I) in said power line;

a **comparison circuit** (16, means for comparing) operable to compare said sensed values of phase difference and current amplitude with a trip characteristic defining fault conditions and non-fault conditions (straight line between points S and F) and to generate a fault **indication** signal when a fault condition arises;
a **fault discriminator** (16, means for producing) operable in response to said fault indication signal to generate a fault **identifying** signal, and
a **trip signal generator** (relay unit 18, means for interrupting) responsive to said fault identifying signal and operable to generate said trip signal.

- 2.5 The subject-matter of claim 1 therefore **differs** from this known device in that the fault discriminator discriminates between
a first class of fault in which a mean current value after said fault indication increases relative to a mean current value before said fault indication; and
a second class of fault in which a mean current value after said fault indication does not increase relative to a mean current value before said fault indication.

This comment also applies to independent claim 12, page 14, lines 5-10.

- 2.6 The distinguishing features are neither disclosed nor rendered obvious by one of the documents D1 or D2 found during search.
3. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in documents D1 is not mentioned in the description, nor is this document identified therein.
The description is not in conformity with the claims as required by Rule 5.1(a)(iii) PCT.
Independent claim 1 is not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would have been appropriate, with those features known in combination from the prior art (document D1) being placed in the preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).